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RECONNAISSANCE INVESTIGATION WATER SUPPLY AND WATER QUALITY CONTROL STUDY, YAQUINA RIVER BASIN, OREGON

Federal Water Pollution Control Administration
Portland, Oregon

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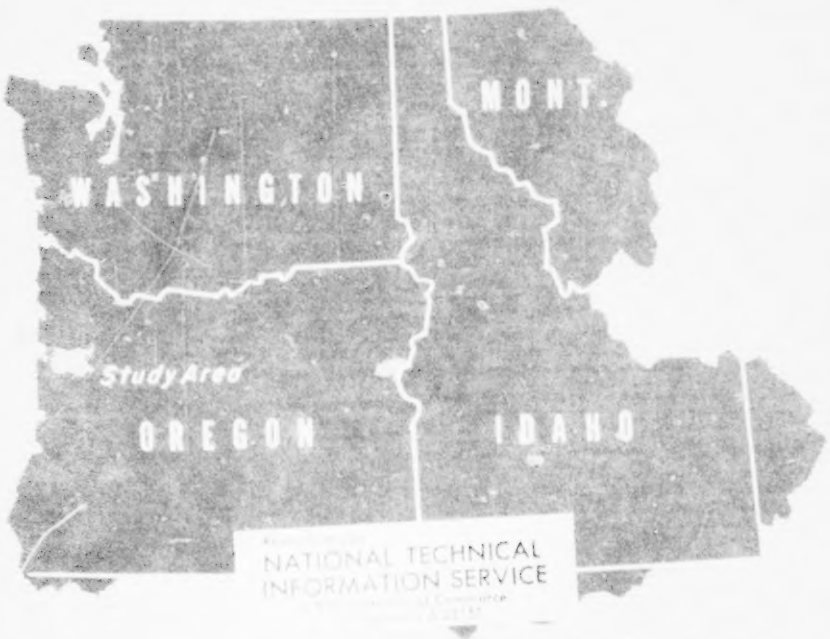
WATER SUPPLY AND WATER QUALITY CONTROL STUDY



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Federal Water Pollution Control Administration

JUNE 1966

UNITED STATES DEPARTMENT OF THE INTERIOR

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RECONNAISSANCE INVESTIGATION
WATER SUPPLY & WATER QUALITY CONTROL STUDY

YAQUINA RIVER BASIN, OREGON

A reconnaissance survey has been made which indicates that future needs for municipal and industrial water in the Yaquina Bay area will require further development of existing sources outside the basin. Preliminary investigations do not indicate a need for flow regulation for water quality control. These conclusions are based on economic, demographic, and engineering studies. Future conditions are based on projected population and industrial growth. A detailed study will be made should specific storage sites be considered.

Prepared at the request of the District Engineer,
U. S. Army Engineer District, Portland
Corps of Engineers, Portland, Oregon

U. S. DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
Portland, Oregon

JUNE 1966

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YAQUINA RIVER BASIN, OREGON

REQUEST AND AUTHORITY

The request for this investigation was made by the District Engineer, U. S. Army Corps of Engineers, Portland, Oregon, by letter dated October 15, 1965. Authority for the investigation and report is the "Federal Water Pollution Control Act," as amended (33 U.S.C. 466 a(b)), and the "Memorandum of Agreement" dated November 4, 1958, between the Departments of the Army and Health, Education, and Welfare, relative to the Water Supply Act of 1958, as amended (43 U.S.C. 390b).

PURPOSE AND SCOPE

The Corps of Engineers requested data on present municipal and industrial (M&I) water supply and water quality control needs for Yaquina River Basin, Oregon, and on such future requirements as could be estimated within the scope of a reconnaissance study. These data are to be used to determine the advisability of initiating detailed investigations of specific storage sites in the Yaquina River Basin. A more detailed study will be conducted at such time as the Corps of Engineers may request information relating to a specific site(s). Preliminary projections were made to the year 2020, with interim dates at 1980 and 2000.

STUDY AREA DESCRIPTION

The area under consideration is the Yaquina River Basin, most of which lies in Lincoln County, Oregon. (See Location Map, back cover.) The river drains 253 square miles on the west slope of the Coast Range and empties into Yaquina Bay on the Pacific Ocean. The communities of Newport and Toledo, wherein resides nearly all of the basin's population, are situated on Yaquina Bay. About 85 percent of the area is covered by forest, 4 percent is crop land, and the remaining 11 percent comprises pasture, urban areas, bay- and seashore. Around 900 acres were under irrigation in 1964, and 4,500 acres of additional land is suitable for irrigation development. It is expected that 1,100 acres might be developed in the near future.

SUMMARY OF FINDINGS AND CONCLUSIONS

Communities and industries located near Yaquina Bay exert the greatest water demand in the study area. However, because of insufficient yield from the Yaquina River, some municipal and industrial (M&I) water needs are now supplied from the Siletz River. Hydrologic studies indicate that future M&I water needs in the Yaquina Bay area can best be met by further development of the Siletz source. Inasmuch as the Siletz Basin is capable of providing all future M&I water requirements in the study area, no storage needs are foreseen which would necessitate development of the Yaquina River Basin.

Water quality in the lower portion of the basin is adversely affected by existing natural and man-made conditions. Inadequately treated wastes from municipalities and industries place an excessive demand on the oxygen resource of Yaquina Bay during annual periods of low streamflow. With adequate treatment--85 percent removal of the biochemical oxygen demand (BOD)--the effect of waste waters can be reduced to acceptable levels throughout the year.

Although further investigation is needed, the results of this reconnaissance study indicate no foreseeable future storage need for water quality control in the Yaquina River Basin.

WATER RESOURCES OF THE STUDY AREA

The average annual yield of the Yaquina River near tidewater is estimated to be about 400,000 acre-feet. Based on precipitation and runoff over the past 25 years, the Oregon State Water Resources Board has developed the following estimates for average monthly discharge:

January	1,131 cfs	July	66 cfs
February	1,241 cfs	August	42 cfs
March	872 cfs	September	44 cfs
April	534 cfs	October	168 cfs
May	800 cfs	November	622 cfs
June	130 cfs	December	1,023 cfs

The limited nature of these data indicates that a better knowledge of streamflow patterns will be needed to permit future basin studies. Stream gages should be established near tidewater and at other suitable locations.

Adequate water quality data are also lacking. Field surveys, including stream sampling, will be necessary when a more detailed study is requested. A brief reconnaissance of the area and data gathered in nearby basins, however, indicate that water in the upper reaches of the river is relatively free of color and turbidity, low in mineral content, and generally of adequate quality for all anticipated uses.

THE ECONOMY

The economy of the area is based on forestry, agriculture, wood processing industries, recreation, and fishing. Industrial production is concentrated in the Toledo and adjoining Yaquina Bay area due primarily to favorable sea, highway, and railroad transportation facilities. The area supports two sawmills, two lumber mills, one shingle mill, one plywood plant, one pulp mill, one ready-mix concrete plant, four seafood plants, plus commercial and sports fishing fleets. Service industries and tourist facilities are located in the Newport area and along the coast. Population of the basin according to 1960 census was 8,710 persons.

Current population and industrial growth trends in the basin have been projected in order to develop estimates of future water requirements. Expansion is taking place primarily in the industrial and tourism fields. The dominant water user is the pulp and paper mill at Toledo. Other existing wood products industries, as well as construction and various service industries, are also expected to show a moderate rate of growth. Scenic attractions along the Oregon Coast, plus recreational activities afforded by the streams, bays, and forest, have made tourism an increasingly important factor of the basin's economy. Recreation and fish life are intense non-consumptive water uses.

From the above considerations, design populations were developed for the Newport-Toledo area. Projections were made for the base population and also for increased summertime population in this area. Data presented below show that the base population will nearly quadruple by year 2020. Rural population is expected to remain unchanged.

Design Population, Study Area	1960	1980	2000	2020
Newport-Toledo Service Area				
Base Population	8,400	12,700	20,900	32,800
Summer Population	--	19,000	30,000	46,000
Rural Area	310	300	300	300

WATER REQUIREMENTS--MUNICIPAL & INDUSTRIAL

Newport obtains water from Blattner and Big Creeks, which lie immediately north of Yaquina Bay. Water is fully treated, including filtration and disinfection. Plant capacity is about 1.5 million gallons per day (mgd). The City's raw water reservoir stores 65 million gallons (mg), which is sufficient to meet present demands during the annual dry season. In addition to domestic and municipal needs, the City also supplies water to local industries. Average demand in 1960 totaled approximately 0.59 mgd and is expected to increase over six-fold by year 2020, as indicated in the following table. The maximum daily demand on the system in 1960 was about 1.2 mgd and by 1965 was 1.5 mgd. This growing daily and seasonal water use, due primarily to the tourist trade, points out the imminent need for additional treatment and storage capacity.

PRESENT & PROJECTED MUNICIPAL WATER NEEDS
NEWPORT-TOLEDO SERVICE AREA
YAQUINA RIVER BASIN, OREGON

Service Area	Potential Service Population	Per Capita Use (gpcd)	Average Demand (mgd)	Max. Monthly Demand (mgd)
NEWPORT				
1960	5,900	100	0.59	0.9
1980	8,900	125	1.11	1.7
2000	14,700	145	2.13	3.3
2020	23,000	160	3.68	5.7
TOLEDO				
1960	3,300	100	0.33	0.5
1980	5,000	125	0.62	0.9
2000	8,200	145	1.19	1.7
2020	12,900	160	2.06	2.9

Toledo obtains water from a reservoir on Mill Creek, which is tributary to the Yaquina River, and from the Siletz River. The water system is capable of producing 1.75 mgd. Chlorination is the only treatment. The average 1960 municipal and industrial demand (M&I) was about 0.33 mgd. Of this, the City supplied over 0.13 mgd to Georgia-Pacific's plywood mill, paper plant, bag plant, and sawmill. In addition, the Georgia Pacific Company has a separate water system on Olalla Creek, which provides its Toledo plant with 14 mgd. During low streamflow periods, storage on Olalla Creek is augmented by pumpage from the Siletz River. The Georgia-Pacific Company's water right authorizes the withdrawal of 40 cubic feet per second (cfs), or 25.8 mgd, from these sources.

WATER QUALITY CONTROL

1. Municipal and Industrial Wastes

Present sources of waste in the study area include domestic, municipal, and industrial waste, plus pollutants which are carried to the streams in land runoff. Yaquina Bay is often quite turbid, resulting primarily from high sediment concentrations in the river. The only significant sources of organic wastes in the basin are located on or near Yaquina Bay. Highest waste loads occur during the summer season with the influx of tourists and summer residents. Seasonal loads also occur at the seafood packing plants and associated industries. Municipal and some industrial wastes from the Newport area are sewered and treated by a recently constructed trickling filter plant designed to serve an equivalent population of 11,600. The plant discharges to the Pacific Ocean.

Future waste production in the Newport area is expected to increase in proportion to population growth. Industrial waste loadings will probably remain nearly constant throughout the study period, as no significant expansion or new plant construction is foreseen for the area.

Toledo has a primary treatment plant which discharges to Yaquina Bay. The plant was designed for a population of 3,500 and, in 1960, served approximately 3,000 persons. In line with projected growth, municipal wastes from the Toledo area will amount to about 13,000 population equivalents (PE) by year 2020. Most of the wastes from the paper mill are pumped to Newport through a pipeline which extends 3,000 feet out into the ocean. The balance, averaging about 25,000 PE, is being discharged to Yaquina Bay. Raw waste production in the future is expected to increase only slightly. It is assumed that the paper company will continue to pipe most of its wastes to the ocean.

2. Water Temperature

Temperature is an important water quality parameter, particularly as it affects the propagation of anadromous fish. Available water temperature data on coastal streams, taken together with the limited data on the Yaquina River Basin, indicate that summer temperatures are moderate in headwater streams but are relatively high in the lower reaches. In these reaches, the maximum diurnal values during July and August generally exceed 70 degrees Fahrenheit (^{o}F) and sometimes approach 80 ^{o}F. Temperatures of this order exceed the upper limits (70 ^{o}F) of the range considered suitable for anadromous fish. Furthermore, the capacity of the streams to assimilate organic wastes is reduced as a result of high temperatures due to the influence exercised by temperature over the dissolved oxygen (DO) content of water.

Although high summer temperatures are hazardous for anadromous fish, their upstream migrations generally occur later in the season. Such adaptation is to be expected in that existing summer temperatures are part of the natural thermal regime, and man's activities have not as yet caused a significant change in that regime. It is concluded that high stream temperatures do not, therefore, pose a threat to maintenance of the fishery resource. The oxygen content of the streams likewise appears to be adequate to deal with the existing level of waste

discharges. Considering present and projected conditions, steps to control stream temperatures in the Yaquina Basin do not, therefore, appear to be necessary.

3. Salinity

Another water quality aspect in the area is the movement of salt water upstream as streamflows decrease. Seasonal low flows are further aggravated by upstream diversions for irrigation and by periodic droughts. This situation severely limits present and potential irrigation along the lower mainstem. Most of the agricultural land in the basin is best adapted to sprinkler irrigation. With full development of all irrigable land in the basin, a total withdrawal of about 50 cfs will be required. However, because little of this water applied by sprinkler would return as surface runoff, stream quality as affected by land runoff waste is not expected to be significant during the low-flow season.

It is estimated that during periods of low flow (5 cfs), the mean position of salt-water penetration will move upstream to about River Mile 25. Depending on tides and wind, the salt-water limit will oscillate about this point and probably reach River Mile 30 (near Chitwood). These conditions would result in a salinity of at least 100 parts per million (ppm) in the vicinity of Chitwood.

To hold the mean position of the salt-water front below Elk City would require a sustained flow of about 35 cfs.1/ Irrigation requirements, while maintaining 35 cfs in the lower reach of the Yaquina River will, therefore, necessitate withdrawals near Elk City.

M&I WATER SUPPLY AND WATER QUALITY CONTROL STORAGE NEEDS

Projections of water supply needs in the Newport area during the estimated 75-day seasonal dry period show a total cumulative demand of about 400 mg by year 2020. In anticipation of the beginning earlier

1/ This conclusion was drawn from data appearing in "Computation of Pollution in the Yaquina River Estuary," by W. V. Burt and L. D. Marriage, 1957, Sewage and Industrial Wastes 29 (12):1385-1389.

need, the City plans to develop additional storage on Big Creek and eventually pump water from the Siletz River.

Demand on Toledo's municipal water facilities is projected to average at least 2 mgd by 2020. At that time, assured flows and/or storage will be needed to provide about 200 mg (615 acre-feet). The paper company foresees a possible future requirement of 50 mgd. Its additional storage needs are estimated to be 4,800 acre-feet (1,565 mg), and sites in the headwaters of the Siletz River have been investigated. These future industrial requirements will be reached as production is stabilized by the optimum sustained yield of local timber lands. In the absence of storage development in the Yaquina Basin, additional water for the Toledo area will probably be obtained from the Siletz River.

The Lincoln County Court has recently sponsored studies of water supply needs in the developing areas of the County. The conclusions drawn were that the most satisfactory and beneficial way to insure sufficient water for the present and future populated areas, including the Yaquina Basin, would be to develop higher-elevation potable sources of water, tie present systems together, make improvements in pipe size and storage facilities, and eventually construct a continuous supply line the full length of the coast. The Siletz River was selected as the most suitable source of supply for Newport, Toledo, and adjacent communities.

According to reports of the Oregon State Water Resources Board, neither the Yaquina River nor its Elk Creek tributary has sufficient minimum streamflow to consider its use in a municipal water plan. The minimum observed flow at tidewater is less than 4 cfs (2.5 mgd). These streams are further rendered undependable because of the amount of water covered under various rights.

According to present information, reservoir storage for water supply will not be needed in the Yaquina Basin within the study period, as water of adequate quantity and quality is readily available and can be obtained economically from the Siletz River system. It is therefore concluded that future water supply needs will not be met by development of storage in the Yaquina Basin. Furthermore, ground-water development is not likely as this source is considered limited due to unfavorable geologic conditions in the area.

Studies of probable future conditions in the study area, specifically along the Yaquina River, indicate no foreseeable need for storage for water quality control. In addition, through year 2020, projected M&I wastes entering Yaquina Bay are not expected to overtax the assimilative capacity of the estuary if adequately treated and disposed. Considering the nature and amount of wastes discharged, the mechanics of dispersion in the estuary, and the quality level that should be protected to maintain the several existing and anticipated uses of bay waters, adequate treatment referred to herein is that treatment or other method of waste control which would result in an over-all removal of at least 85 percent of all oxidizable dissolved and colloidal material produced in the area.

The Oregon State Game Commission recommends a minimum perennial streamflow of 10 cfs for fish life in the Yaquina River. If this flow cannot be maintained by adjudication of water rights for irrigation and other consumptive uses, then storage is indicated. However, no suitable reservoir sites have been located in the upper Yaquina River watershed.

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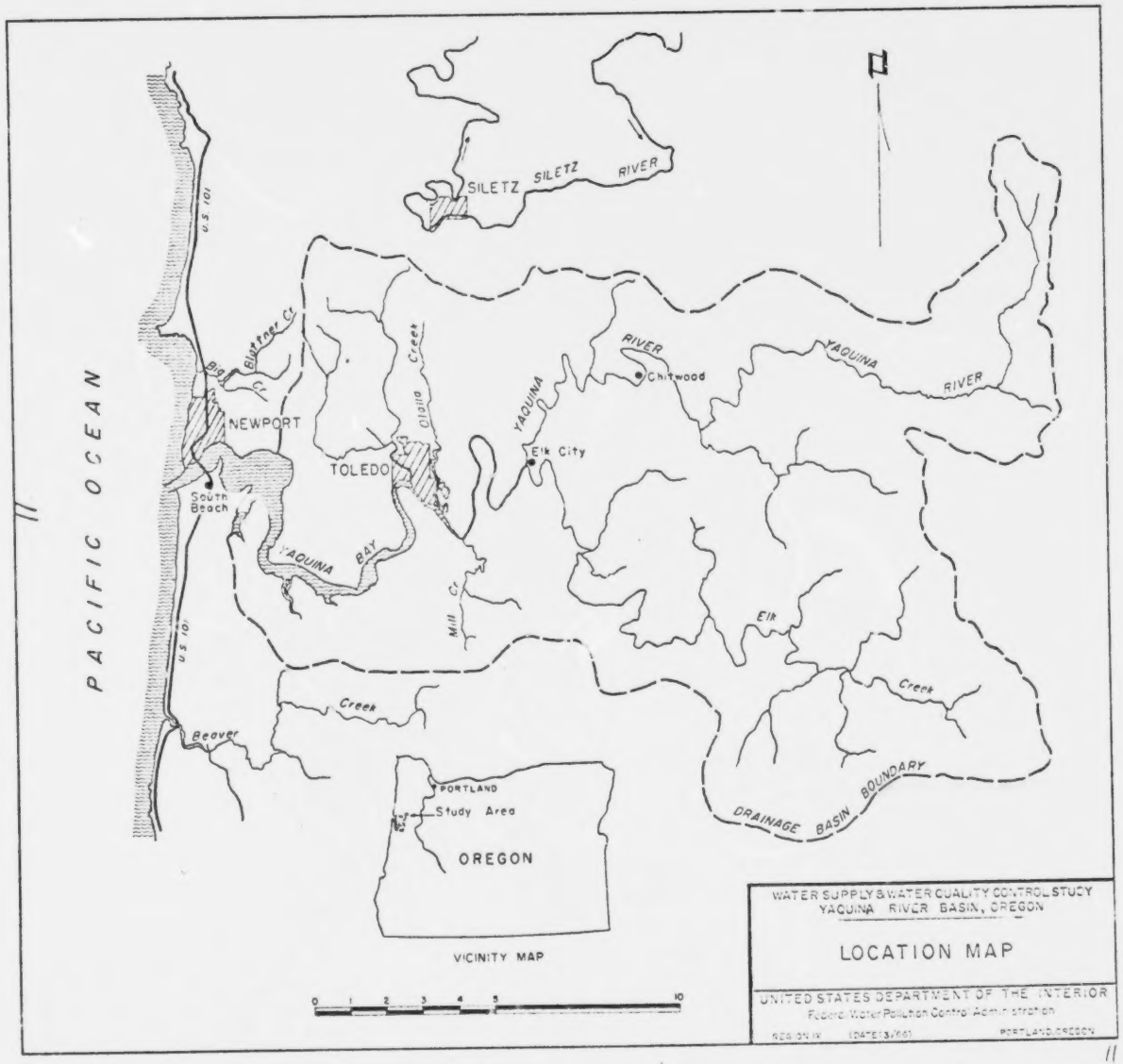

WATER SUPPLY & WATER QUALITY CONTROL STUDY
YAQUINA RIVER BASIN, OREGON

LOCATION MAP

UNITED STATES DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration

REGION IX [illegible] PORTLAND, OREGON